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In this manner the Donbs traverses the basin of Morteau, receiving a rivulet from its interior as it passes.—M. Cotteau also contributes a note upon the Jurassic echinids of Algeria, forty-seven in number. One only of these species is found in the Oxford stage; thirty-seven to the upper coralline, and seven seem to be Kimmeridgian. Nineteen are new and known only in Algeria, while the remainder occur in Europe, usually at the same stratigraphic levels.

Tertiary.—The cerebral hemispheres of *Arctocyon dueilii* and *Pleuraspidothorium aumonieri*, discovered by M. Lemoine in the Eocene of the environs of Rheims, are stated by that geologist to be so reduced in dimensions as to be scarcely superior in transverse diameter to the olfactory or the optic lobes, the latter of which are entirely uncovered.—M. Hebert (Bull. de la Soc. Geol. de la France, 1882) has described in detail the nummulitic group of the south of France. This group belongs to the Middle and Upper Eocene, and occurs in the Central Pyrenees, at Chalosse, at Corbières and Montagne Noire, and in the environs of Nice.

General.—Mr. G. K. Gilbert states that the great fault along the western base of the Wasatch mountains is wanting opposite Salt Lake City. He suspects that the fault will yet be completed at that point, and that when the slip occurs it will cause an earthquake which will destroy Salt Lake City.

MINERALOGY.¹

EXPERIMENTAL STUDIES UPON ROCKS.—M. J. Thoulet,² after deploing the absence of general results arrived at by lithologists, has proposed to himself the study of all the physical properties of the same rock in order that, by a comparison of the data thus obtained, any relations which exist between these diverse properties may be discovered, and at all events the physical constants of the rock may be systematically stated. He holds that lithology should be systematized by the common application of both the physical and natural sciences to the study of the genesis of rocks, and shows the necessity of obtaining, in the first place, exact figures upon which to found satisfactory conclusions.

He gives the physical properties of a basalt and of a compact limestone, enumerating succinctly the locality, the macroscopic and microscopic appearance, specific gravity, chemical composition, *hygrometricity* or amount of moisture ordinarily contained, *imbibition*, or faculty of absorbing water, thermic conductibility, specific heat and resilient elasticity or power of rebounding.

This method of proceeding, although laborious, is believed to be alone capable of furnishing certain results.

¹ Edited by Professor H. CARVILL LEWIS, Academy of Natural Sciences, Philadelphia, to whom communications, papers for review, etc., should be sent.

² Bull. Soc. Mineralogique de France, T. VI, No. 6, p. 161.

The *hygrometricity*, or amount of moisture absorbed from the air, is obtained by heating the rock at 100° C. until the weight is constant, and reducing the result to decimals. In expressing the hygrometricity of basalt as 0.371, it is meant that 100 grammes of the dry rock weigh 100.371 after the expulsion of the humid air. The hygrometricity of limestone is 1.669.

The *imbibition*, or faculty of absorbing water, is measured by soaking the rock in water for some time under the bell glass of an air pump, and then weighing after it has been carefully wiped. It represents the maximum of water absorbed by 100 grammes of rock perfectly dried at 100° C. The imbibition of basalt is 0.551, of limestone 1.981.

The thermic resistance and coefficient of thermic conductivity is obtained by determining the time, in seconds, which it takes for an interval of temperature of 34° C., issuing from a fixed source of heat at 100° C. to traverse the thickness of one centimeter of rock. The temperature of the rock at the beginning and end of the experiment is noted, as well as its weight, amount of surface, thickness, etc., much care being required for this determination. The thermic resistance is obtained graphically from these data. For basalt it is given as 83, and for limestone as 59.

The specific heat is obtained by a method previously described by Lagarde and the author, and involves the immersion of the rock in alcohol whose volume, density and specific heat are previously known. Thomson's galvanometer is used in the experiments, and the specific heat of basalt is determined as 0.2699, and of limestone as 0.253.

The elasticity of rebounding, which is directly related to the molecular elasticity developed by either optical, thermic or mechanical vibrations, is determined very simply, by counting the number of times that a ball of ivory rebounds from the rock. While quartz causes the ball to rebound 42.2 times, basalt causes it to rebound 25.9 times, and limestone 35.48 times. Taking the elasticity of quartz as the unit, the resilient elasticity of basalt is 0.614, and of limestone 0.840.

STIBNITE FROM JAPAN.—The very beautiful crystals and groups of crystals of stibnite from Japan, are already well known to a number of mineralogists. The specimens, by their beauty, brilliancy and size, will attract attention in any cabinet. They are said to come from the Island of Jaegimeken Kannaizu, in South Japan, where the antimony mines have long been worked. The crystallized specimens are valued as ornaments by the natives, who sometimes mount them in flower pots and use them to adorn their dwellings.

In a recent paper in the *American Journal of Science*, by Professor E. S. Dana, describing some remarkably fine specimens recently received by the museum at Yale College, it is shown

that the crystals are noteworthy, not only on account of their size and beauty, but also for their great complexity of form.

Some crystals measured nearly two feet in length and two inches in diameter. They occur in groups, which consist of diverging crystals, many of which may be over a foot in length. The prismatic planes are deeply striated, and the end of each crystal is finely terminated by brilliantly polished planes. The luster of these planes is unexcelled among metallic minerals, and can be compared only with that of polished steel, as, for example, the surface of a razor blade.

Professor E. S. Dana has observed as many as *eighty-five* planes on these Japanese crystals. Forty-five planes was the largest number previously observed on stibnite, so that forty new planes are thus added. Some of the most complex crystals are the smallest ones. Sometimes, even on large crystals, the minute terminal planes are so rounded into each other that they could not be measured. Often these steep pyramidal planes so sharpen the end of the crystal as to give it a spear-shaped appearance.

A common peculiarity of the Japanese crystals, as indeed of all stibnite, is a bending over in the direction of the macrodiagonal axis. The edge of the crystal, near its termination, may be bent so as to form a right angle with itself. Crystals of stibnite from other localities have been described which were bent to such a degree as to form a complete ring. This curious peculiarity appears in all cases as if produced subsequently to the formation of the crystal. It has been shown that a slight pressure will permanently distort a crystal of stibnite.

The axial ratio as deduced from the measured angles is found to be :

$$a : b : c = 1 : 1.00749 : 1.02550$$

In order to preserve the brilliant luster of these crystals, we suggest that mineralogists keep them in a dark place, well protected from dust and dampness.

A BEAUTIFUL CRYSTAL OF APATITE.—A. Schmidt, of Strassburg, describes and figures in the last number of *Zeitschrift für Kryst.* (VII Band, 6 Heft), a remarkably beautiful crystal of colorless apatite from Floitenthale, a new locality. The specimen, which measures only about 1.5 centimeters in length, and which resembles a garnet in general shape, being nearly equi-axed, for geometrical beauty of shape and complex but symmetrical proportions can hardly be excelled, unless indeed the figure given greatly idealizes it. The specimen belongs to the Hungarian National Museum.

PRECIOUS IOLITE FROM BRAZIL.—In looking over a collection of Brazilian minerals, Professor Groth recently noticed a colorless

prismatic mineral labeled topaz, which attracted his attention from the fact that it showed no trace of cleavage on the broken end, but had an irregular, conchoidal fracture. A trial of the specific gravity gave 2.67, too low for topaz, and it was concluded that the crystal was iolite (cordierite). The crystal was 1.5 centimeters long and 1 centimeter broad, larger than ever before known in Brazilian crystals. The absence of color in such a large crystal indicates that the usual deep bluish color is accidental and due to some coloring pigment.

SEPARATION OF MINERALS ACCORDING TO THE DEGREE OF COHESION.—Büttgenbach¹ has suggested the separation of minerals on a large scale by making use of the difference in their degree of brittleness or firmness. Hitherto such separation has been effected mainly by differences in specific gravity or in attractability by the magnet. The author has devised a practical method of separating ores, based upon the fact that by casting two minerals of different degrees of hardness against a solid body, the one is broken into smaller pieces than the other. In separating pyrites from zinc blende the mixture was cast three times against the sides of a cylinder, and then sifted through separating drums, when it was found that the particles which passed through the finer sieves consisted chiefly of blende, while the larger pieces left behind were pyrites.

LITHIOPHILITE.—Mr. S. L. Penfield² has published two new analyses of lithiophilite, which are of interest in that they substantiate the formula of an orthophosphate, Li (Mn, Fe) PO_4 , for the species, and taken together with his previously published analyses, complete a series showing a gradual transition between the two extremes of a lithia-iron phosphate containing little manganese (triphylite) and a lithia-manganese phosphate containing but little iron (lithiophilite). Lithiophilite is, therefore, a man-ganesian variety of triphylite.

One of the analyses was made on a pale bluish, transparent, brilliant lithiophilite from Branchville, Conn., and the other upon specimens from Norway, Maine, a new locality. The specimens from the latter place are blackened on the exterior by the oxidation to which this mineral is particularly liable, but in the interior are of a light salmon color.

SOME RECENTLY FORMED MINERALS.—A. Lacroix has artificially produced crystals of gypsum by treating pulverized fluorite with sulphuric acid and then adding water. After standing for several months at a low temperature until the liquid had evaporated, small but beautiful transparent crystals of gypsum were found upon the fluorite and on the sides of the containing flask.

¹ *Dingl. Polytech. Journ.*, 248, 112.

² *Amer. Journ. Sc.*, Sept., 1883.

In crystalline form as well as in the mode of grouping, the crystals closely resemble some small crystals of gypsum which occur at the salt works of Bex, Canton of Vaux. These may also be of recent origin.

The same author has described some interesting minerals which have formed upon some old Roman coins of the time of the Emperor Alexander Severus (205-234 A. D.), which were buried in a mass of rubbish in Algeria. The coins contain eighty per cent of copper, sixteen per cent of lead and four per cent of tin, and through the action of dampness have become oxidized so as to form malachite, azurite, cuprite and cerussite. The coins were cemented by cavernous malachite, in the interstices of which were crystals of the above minerals. The cuprite occurred in cubes of cochineal-red color, and the azurite in clear blue crystalline masses. The cerussite, the most interesting mineral noticed, occurred both in crystals and in crystalline masses of yellowish-white color and adamantine luster. The crystals of this mineral, never before noticed under similar conditions, sometimes were directly implanted upon the partially altered coins.

PYRITES FOR SULPHURIC ACID.—It is now stated that sulphuric acid can be made as cheaply from American pyrites as from imported brimstone, and considering the great difference in freight between the two raw minerals, the price of acid made from our pyrites will be much lowered. Immense deposits of pyrites occur in Virginia, and these will undoubtedly be used in large quantities for the manufacture of sulphuric acid. Should the manufacturers of our sea-board cities use pyrites instead of sulphur for this purpose, it is stated that commercial acid (66° B.) can be made by them at one cent per pound. A most important industry of great value to the country can thus be opened, and many mines of pyrites will be opened to add to the mineral wealth of the Eastern States.

PICRANALCIME.—Some years ago Bechi described a mineral from Monte Caporciano, Tuscany, under the name of *picranalcime*. It was stated to be an analcime of a red color containing ten per cent of magnesia, and only a half per cent of soda, and was generally regarded by mineralogists as an alteration from analcime. Bamberger, however, has shown that there is no magnesia in the mineral, and that in every respect, crystallographically, optically and chemically, it agrees with analcime. The name "*picranalcime*" must therefore be dropped from the list of minerals.

MINERALOGICAL NOTES.—To determine the mineralogical species to which the *jade* of different localities properly belongs, frequently requires a chemical analysis. Specimens of jade from New Zealand and from Southern Turkestan, the latter from a mine once worked by the Chinese, have been analyzed by C. L.

Allen and determined to be amphibole.—Klein has recently examined some crystals of *ullmannite* from Sardinia. The principal planes were those of the cube, which was striated as in pyrite, being due to the same cause, the repetition of pyritohedral edges. Pyritohedral and dodecahedral planes also occurred. The specific gravity was somewhat higher than usual, being 6.84. An analysis showed a mere trace of arsenic. The determined percentages of nickel, sulphur and antimony agree closely with the formula, Ni (Sb, S). The crystals were imbedded in calcite.—It has been found that almost all platinum ore is magnetic, and that no purification can be effected by means of a magnet. Even a weak magnet will attract a large percentage of platinum along with the iron in an impure ore. Experiments have shown, indeed, that as much platinum as iron is attracted.—*Gold* is reported as occurring in a Cretaceous limestone in Williamson county, Texas. It is supposed to have originally existed as an auriferous pyrite, by the decomposition of which the sulphur has been removed, the iron oxidized and the gold concentrated.

BOTANY.¹

WATSON'S CONTRIBUTIONS TO AMERICAN BOTANY, XI.—We have the pleasure of again noticing another of Mr. Watson's frequent publications, this time a thick pamphlet of one hundred pages, extracted from the Proceedings of the American Academy of Arts and Sciences (Vol. XVIII). It bears date of August 15, 1883, and contains descriptions of many new species. There is first a list of plants from Southwestern Texas and Northern Mexico, collected chiefly by Dr. E. Palmer in 1879–80, occupying nearly the whole pamphlet; this is followed by five pages devoted to descriptions of some new Western species.

The Commelinaceæ of the United States are revised in a footnote, and a synopsis of genera and species given. There is likewise a revision of the genus *Bouteloua*, based upon a study of the material in the Gray Herbarium. Twenty-five species are recognized, as follows: 1. *B. tenuis* Griseb., Mexico; 2. *B. prostrata* Lag., W. Texas and New Mexico to Mexico; 3. *B. simplex* Lag., South America; 4. *B. scorpioides* Lag., Mex.; 5. *B. hirsuta* Lag., Ill. to Tex., Arizona and Mex.; 6. *B. oligostachya* Torr., Saskatchewan to Tex., Ariz., S. E. Cal. and Mex.; 7. *B. polystachya* Torr., S. Utah to Tex., S. Cal. and Mex.; 8. *B. eriopoda* Torr., W. Tex. and New Mex.; 9. *B. trifida* Thurber, W. Tex., New Mex. and Mex.; 10. *B. burkei* Scribner, W. Tex. and New Mex.; 11. *B. racemosa* Lag., N. Y. and Pa. to Wis., Tex., Ariz. and Mex. [this is the *B. curtipendula* Torr., of the manuals]; 12. *B. bromoides* Lag., W. Tex. to Ariz. and Mex.; 13. *B. havardi* Vasey, W. Tex.; 14. *B. chondrosioides* Benth., Mex.; 15. *B. litigiosa* Lag., W. Indies;

¹ Edited by PROF. C. E. BESSEY, Ames, Iowa.